Summary of Sample Depths Collected as part of the WQS for all Five Lakes

Appendix P

Revision 01, March 2004

Table 1. Lake Erie - Summary of Sample Depths Collected as part of the WQS

Spring		Summer	
Non-Master Station	**Master Station**	**Non-Master Station**	**Master Station**
SRF	SRF	SRF	SRF
MID	5M	MEP	MEP
B10 (only Eastern Basin)	10M	DCL	LEP
B1	20M (only Eastern Basin)	MHY	TRM
INT-SPR	30M (only Eastern Basin)	B1	DCL (only Eastern Basin)
	40M (only Eastern Basin)	INT-SUM	UHY
	B10 (only Eastern Basin)		MHY (only Central Basin)
	B1		40M (only Eastern Basin)
	INT-SPR		B10 (only Eastern Basin)
			B1
			INT-SUM

Exceptions to this Sampling Scheme:
Exceptions to this sampling scheme may occur depending upon the thermal structure at the time of sampling. These exceptions do not apply to the integrated samples. To eliminate sampling redundancy, the following specifications apply to the sampling regime:

- If an integer meter depth falls within 2 m of B10, then the integer meter depth sample is omitted.
- If B10 falls within 2 m of a stratification depth, the B10 sample is omitted.
- If an integer meter depth falls within 3 m of a stratification depth, the integer meter depth sample is omitted.
- In the summer, if there is a DCL, a sample is taken (at non-master and master stations in the Eastern basin and at non-master stations in the Central and Western basins). If other designated samples are within 3 meters of the DCL, they are not taken.

Integrated Sample Definition:
For an unstratified water column, the integrated sample is prepared by taking equal volumes of water from SRF, 5 m, 10 m and 20 meters unless the depth is less than 20 meters. If the total depth is between 15 and 22 meters, the 20 meter sample is replaced by the bottom sample (B1 or B2). If the total depth is less than 15 meters, equal volumes are taken from surface, mid-depth, and bottom sample (B1 or B2).

For a stratified water column, equal volumes are taken from the surface, 5 m, 10 m, and LEP. If the epilimnion is very shallow, equal volumes are taken from a maximum of four sampling depths and a minimum of two sampling depths. The underlying strategy is to collect a representative sample from the epilimnion.

Thermal Structure Abbreviations:

SRF	=	Surface (1 m)
MEP	=	Mid-epilimnion
LEP	=	Lower epilimnion
TRM	=	Thermocline
DCL	=	Deep Chlorophyll Layer
UHY	=	Upper hypolimnion
MHY	=	Mid-hypolimnion
MID	=	Mid-depth
B10	=	Bottom minus 10 m
B1	=	Bottom minus 1 m
INT-SPR	=	Integrated sample in spring
INT-SUM	=	Integrated sample in summer

Table 2. Lake Huron - Summary of Sample Depths Collected as part of the WQS

Spring		Summer	
Non-Master Station	**Master Station**	**Non-Master Station**	**Master Station**
SRF	SRF	SRF	SRF
MID	5M	MEP	MEP
B10	10M	DCL	LEP
B2 (if inverse stratification is not present, only analyzed for board chemistry parameters)	20M	MHY	TRM
INT-SPR	30M	B10	DCL
	40M	B2	UHY
	50M	INT-SUM	40M
	B10		50M
	B2		B10
	INT-SPR		B2
			INT-SUM

Exceptions to this Sampling Scheme:
Exceptions to this sampling scheme may occur depending upon the thermal structure at the time of sampling. These exceptions do not apply to the integrated samples. To eliminate sampling redundancy, the following specifications apply to the sampling regime:

- If an integer meter depth falls within 2 m of B10, then the integer meter depth sample is omitted.
- If B10 falls within 2 m of a stratification depth, the B10 sample is omitted.
- If an integer meter depth falls within 3 m of a stratification depth, the integer meter depth sample is omitted.
- In the summer, if there is a DCL, a sample is taken. If other designated samples are within 3 meters of the DCL, they are not taken.
- If the UHY sample is between 37 m and 47 m, the 40 m sample is not taken.

Integrated Sample Definition:
For an unstratified water column, the integrated sample is prepared by taking equal volumes of water from SRF, 5 m, 10 m and 20 meters unless the depth is less than 20 meters. If the total depth is between 15 and 22 meters, the 20 meter sample is replaced by the bottom sample (B1 or B2). If the total depth is less than 15 meters, equal volumes are taken from surface, mid-depth, and bottom sample (B1 or B2).

For a stratified water column, equal volumes are taken from the surface, 5 m, 10 m, and LEP. If the epilimnion is very shallow, equal volumes are taken from a maximum of four sampling depths and a minimum of two sampling depths. The underlying strategy is to collect a representative sample from the epilimnion.

Thermal Structure Abbreviations:

SRF	=	Surface (1 m)
MEP	=	Mid-epilimnion
LEP	=	Lower epilimnion
TRM	=	Thermocline
DCL	=	Deep Chlorophyll Layer
UHY	=	Upper hypolimnion
MHY	=	Mid-hypolimnion
MID	=	Mid-depth
B10	=	Bottom minus 10 m
B2	=	Bottom minus 2 m
INT-SPR	=	Integrated sample in spring
INT-SUM	=	Integrated sample in summer

Table 3. Lake Michigan - Summary of Sample Depths Collected as part of the WQS

Spring		Summer	
Non-Master Station	**Master Station**	**Non-Master Station**	**Master Station**
SRF	SRF	SRF	SRF
MID	5M	MEP	MEP
B10	10M	DCL	LEP
B2 (if inverse stratification is not present, only analyzed for board chemistry parameters)	20M	MHY	TRM
INT-SPR	30M	B10	DCL
	40M	B2	UHY
	50M	INT-SUM	40M
	100		50M
	200		100
	B10		200
	B2		B10
	INT-SPR		B2
			INT-SUM

Exceptions to this Sampling Scheme:
Exceptions to this sampling scheme may occur depending upon the thermal structure at the time of sampling. These exceptions do not apply to the integrated samples. To eliminate sampling redundancy, the following specifications apply to the sampling regime:

- If an integer meter depth falls within 2 m of B10, then the integer meter depth sample is omitted.
- If B10 falls within 2 m of a stratification depth, the B10 sample is omitted.
- If an integer meter depth falls within 3 m of a stratification depth, the integer meter depth sample is omitted.
- In the summer, if there is a DCL, a sample is taken. If other designated samples are within 3 meters of the DCL, they are not taken.
- If the UHY sample is between 37 m and 47 m, the 40 m sample is not taken.

Integrated Sample Definition:
For an unstratified water column, the integrated sample is prepared by taking equal volumes of water from SRF, 5 m, 10 m and 20 meters unless the depth is less than 20 meters. If the total depth is between 15 and 22 meters, the 20 meter sample is replaced by the bottom sample (B1 or B2). If the total depth is less than 15 meters, equal volumes are taken from surface, mid-depth, and bottom sample (B1 or B2).

For a stratified water column, equal volumes are taken from the surface, 5 m, 10 m, and LEP. If the epilimnion is very shallow, equal volumes are taken from a maximum of four sampling depths and a minimum of two sampling depths. The underlying strategy is to collect a representative sample from the epilimnion.

Thermal Structure Abbreviations:

SRF	=	Surface (1 m)
MEP	=	Mid-epilimnion
LEP	=	Lower epilimnion
TRM	=	Thermocline
DCL	=	Deep Chlorophyll Layer
UHY	=	Upper hypolimnion
MHY	=	Mid-hypolimnion
MID	=	Mid-depth
B10	=	Bottom minus 10 m
B2	=	Bottom minus 2 m
INT-SPR	=	Integrated sample in spring
INT-SUM	=	Integrated sample in summer

Table 4. Lake Ontario - Summary of Sample Depths Collected as part of the WQS

Spring		Summer	
Non-Master Station	**Master Station**	**Non-Master Station**	**Master Station**
SRF	SRF	SRF	SRF
MID	5M	MEP	MEP
B10	10M	DCL	LEP
B2 (if inverse stratification is not present, only analyzed for board chemistry parameters)	20M	MHY	TRM
INT-SPR	30M	B10	DCL
	40M	B2	UHY
	50M	INT-SUM	40M
	100		50M
	B10		100
	B2		B10
	INT-SPR		B2
			INT-SUM

Exceptions to this Sampling Scheme:
Exceptions to this sampling scheme may occur depending upon the thermal structure at the time of sampling. These exceptions do not apply to the integrated samples. To eliminate sampling redundancy, the following specifications apply to the sampling regime:

- If an integer meter depth falls within 2 m of B10, then the integer meter depth sample is omitted.
- If B10 falls within 2 m of a stratification depth, the B10 sample is omitted.
- If an integer meter depth falls within 3 m of a stratification depth, the integer meter depth sample is omitted.
- In the summer, if there is a DCL, a sample is taken. If other designated samples are within 3 meters of the DCL, they are not taken.
- If the UHY sample is between 37 m and 47 m, the 40 m sample is not taken.

Integrated Sample Definition:
For an unstratified water column, the integrated sample is prepared by taking equal volumes of water from SRF, 5 m, 10 m and 20 meters unless the depth is less than 20 meters. If the total depth is between 15 and 22 meters, the 20 meter sample is replaced by the bottom sample (B1 or B2). If the total depth is less than 15 meters, equal volumes are taken from surface, mid-depth, and bottom sample (B1 or B2).

For a stratified water column, equal volumes are taken from the surface, 5 m, 10 m, and LEP. If the epilimnion is very shallow, equal volumes are taken from a maximum of four sampling depths and a minimum of two sampling depths. The underlying strategy is to collect a representative sample from the epilimnion.

Thermal Structure Abbreviations:

SRF	=	Surface (1 m)
MEP	=	Mid-epilimnion
LEP	=	Lower epilimnion
TRM	=	Thermocline
DCL	=	Deep Chlorophyll Layer
UHY	=	Upper hypolimnion
MHY	=	Mid-hypolimnion
MID	=	Mid-depth
B10	=	Bottom minus 10 m
B2	=	Bottom minus 2 m
INT-SPR	=	Integrated sample in spring
INT-SUM	=	Integrated sample in summer

Table 5. Lake Superior - Summary of Sample Depths Collected as part of the WQS

Spring		Summer	
Non-Master Station	**Master Station**	**Non-Master Station**	**Master Station**
SRF	SRF	SRF	SRF
MID	5M	MEP	MEP
B10	10M	DCL	LEP
B2 (if inverse stratification is not present, only analyzed for board chemistry parameters)	20M	MHY	TRM
INT-SPR	30M	B10	DCL
	40M	B2	UHY
	50M	INT-SUM	40M
	100		50M
	200		100
	B10		200
	B2		B10
	INT-SPR		B2
			INT-SUM

Exceptions to this Sampling Scheme:
Exceptions to this sampling scheme may occur depending upon the thermal structure at the time of sampling. These exceptions do not apply to the integrated samples. To eliminate sampling redundancy, the following specifications apply to the sampling regime:

- If an integer meter depth falls within 2 m of B10, then the integer meter depth sample is omitted.
- If B10 falls within 2 m of a stratification depth, the B10 sample is omitted.
- If an integer meter depth falls within 3 m of a stratification depth, the integer meter depth sample is omitted.
- In the summer, if there is a DCL, a sample is taken. If other designated samples are within 3 meters of the DCL, they are not taken.
- If the UHY sample is between 37 m and 47 m, the 40 m sample is not taken.

Integrated Sample Definition:
For an unstratified water column, the integrated sample is prepared by taking equal volumes of water from SRF, 5 m, 10 m and 20 meters unless the depth is less than 20 meters. If the total depth is between 15 and 22 meters, the 20 meter sample is replaced by the bottom sample (B1 or B2). If the total depth is less than 15 meters, equal volumes are taken from surface, mid-depth, and bottom sample (B1 or B2).

For a stratified water column, equal volumes are taken from the surface, 5 m, 10 m, and LEP. If the epilimnion is very shallow, equal volumes are taken from a maximum of four sampling depths and a minimum of two sampling depths. The underlying strategy is to collect a representative sample from the epilimnion.

Thermal Structure Abbreviations:

SRF	=	Surface (1 m)
MEP	=	Mid-epilimnion
LEP	=	Lower epilimnion
TRM	=	Thermocline
DCL	=	Deep Chlorophyll Layer
UHY	=	Upper hypolimnion
MHY	=	Mid-hypolimnion
MID	=	Mid-depth
B10	=	Bottom minus 10 m
B2	=	Bottom minus 2 m
INT-SPR	=	Integrated sample in spring
INT-SUM	=	Integrated sample in summer

Integrated Sample for a Stratified Water Column

In addition to the discreet samples, a composite (integrated) sample is prepared from the upper region of the water column. For a stratified water column, equal volumes are taken from the surface (1 m), 5 m, 10 m, and lower epilimnion (LEP). If the epilimnion is very shallow, equal volumes are taken from a maximum of four sampling depths and a minimum of two sampling depths. The underlying strategy is to collect a representative sample from the epilimnion. If the LEP sample is not easily defined by the thermal profile, the following procedure involving the knees of the EBT temperature depth trace can be used. The knees of the EBT temperature depth trace are determined by trisecting the angle between the epilimnion and mesolimnion temperature traces (upper knee) and the angle between the mesolimnion and hypolimnion temperature traces (lower knee). The upper knee is the upper ⅓ angle intercept, the lower knee is the lower ⅓ angle intercept. The lower epilimnion sample is one meter above the upper knee. Figure 1 of Section 4.3 of LG 200, *Field Sampling Using the Rosette Sampler*, is an example profile that illustrates this determination.

The table below provides the exact sampling depths to be taken depending upon the depth of the epilimnion.

Integrated Sampling Depths for Stratified Conditions

Depth of the Epilimnion	Integrated Sampling Depths for Stratified Conditions
3 m	SRF and 2 m
4 m	SRF and 3 m
5 m	SRF and 4 m
6 m	SRF and 5 m
7 m	SRF and 5 m
8 m	SRF and 5 m
9 m	SRF, 5 m and 8 m
10 m	SRF, 5 m and 9 m
11 m	SRF, 5 m and 10 m
12 m	SRF, 5 m and 10 m
13 m	SRF, 5 m and 10 m
14 m	SRF, 5 m, 10 m and 13 m
15 m	SRF, 5 m, 10 m and 14 m
16 m	SRF, 5 m, 10 m and 15 m
17 m	SRF, 5 m, 10 m and 16 m
18 m	SRF, 5 m, 10 m and 17 m
19 m	SRF, 5 m, 10 m and 18 m
20 m	SRF, 5 m, 10 m and 19 m
Any depths ≥ 21 m	SRF, 5 m, 10 m and bottom of the epilimnion minus one meter

NOTE: SRF =Surface (1 m)